PRG

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/497,533	02/03/2000	Samuel D. Naffziger	10990471-1	7597

22879 7590 04/02/2003

HEWLETT PACKARD COMPANY
P O BOX 272400, 3404 E. HARMONY ROAD
INTELLECTUAL PROPERTY ADMINISTRATION
FORT COLLINS, CO 80527-2400

EXAMINER	
HARKNESS, CHARLES A	
ART UNIT	**PAPER NUMBER**
2183	5

DATE MAILED: 04/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PRG

PRC

Office Action Summary	Application No.	Applicant(s)	
	09/497,533	NAFFZIGER, SAMUEL D.	
	Examiner	Art Unit	
	Charles A Harkness	2183	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☒ Claim(s) *3 and 13-23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. In view of Applicant's amendment to the title, the previous objection has been withdrawn.

Claim Objections

2. Claims 3 and 13-23 is objected to because of the following informalities: It is not clear in claim 3 what "propagated monotonically through said logic elements" or "propagate a plurality of signals monotonically" or "during a launch cycle a set of signals monotonically to successive launch logic" means. The references cited by Applicant mention "a dual monotonic-pair" and rising or falling monotonically, but do not give a good description of what the distinction is when a signal is propagating monotonically versus propagating another way. This could possibly mean to propagate without changing (i.e. monotonous) as it passes through the logic elements, or increasing without decreasing, or decreasing without increasing. Please amend to clear up these discrepancies. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Lesartre et. al., U.S. Patent Number 5,761,474 (herein referred to as Lesartre).

5. Referring to claim 1 Lesartre has taught a method for finding a predefined plurality of instructions, if available, that are ready to be executed and that reside in an instruction reordering

mechanism of a processor that can execution of instructions out of order via a predefined number of ports (Lesartre column 6 lines 57-63; since in Lesartre's preferred embodiment, there are 4 ports to the execution units open per cycle, 2 for integer and 2 for floating-point, no more than 4 instructions could be allowed to launch per cycle), comprising the steps of:

(a) providing said instruction reordering mechanism having a plurality of said instructions, each said instruction having respective logic element for causing and preventing launching, when appropriate, of said instruction (Lesartre column 2 lines 23-28 and 42-47); and

(b) propagating a set of signals successively during a launch cycle through said logic elements of said instruction reordering mechanism that causes said logic elements to track which of the predefined plurality of said instruction are launched and causes the selection of no more than said predefined number of ports during said launch cycle (Lesartre column 2 lines 27-42 and 60-66; and column 7 lines 29-31 ; and column 1 lines 10-12, plurality of instructions interpreted as issuing one instruction after another and so on; the system taught by Lesartre would propagate the signals during a launch cycle so that the system knew which instructions to launch. If the signals were propagated after the launch cycle, the system would not be able to properly function; inherently, the system would have to keep track of which ports are available; otherwise the system may try to launch two slots using the same port, which what cause an error; only one slot can be launched in each port, so it is required of the system to track which port is or is not available for each clock cycle).

6. Referring to claim 2 Lesartre has taught where the method further comprises the step of advising each instruction of said instruction reordering mechanism during each launch cycle

either that said instruction will be launched or that said instruction will not be launched (Lesartre column 2 line 60-column 3 line 8 and column 2 lines 36-42).

7. Referring to claim 3 Lesartre has taught wherein said signals are propagated monotonically through said logic elements (Lesartre column 2 lines 36-42 and column 2 line 60-column 3 line 8).

8. Referring to claim 4 Lesartre has taught where the method further comprises the step of communicating said predefined plurality of said instructions to a corresponding predefined plurality of ports associated with one or more execution resources (Lesartre column 5 lines 26-30 and 41-46).

9. Referring to claim 5 Lesartre has taught where the method further comprises the step of, after said predefined plurality of said instructions have been selected, propagating a lost signal to remaining logic elements associated with remaining instructions of said instruction reordering mechanism to indicate to said remaining logic elements that their respective remaining instructions have not been selected (Lesartre column 2 lines 35-48; valop signal is propagated forward between the aslots showing if there is a dependency precedes, and if so, indicating to the other aslots that they have not been selected).

10. Referring to claim 6 Lesartre has taught where the method further comprises the of steps:

(c) after said predefined plurality of said instructions have been selected, propagating a lost signal to remaining logic elements associated with remaining instructions of said instruction reordering mechanism to indicate to said remaining logic elements that their respective remaining instructions have not been selected (Lesartre column 2 lines 35-48; valop signal is

propagated forward between the aslots showing if there is a dependency precedes, and if so, indicating to the other aslots that they have not been selected);

(d) performing steps (b) and (c) during a single cycle associated with one or more execution resources (Lesartre column 2 lines 35-42, the valop signal is used for rejecting both steps (b) and (c), therefore the steps must occur in a single cycle, because it is the same signal); and

(e) communicating said predefined plurality of said instructions from said instruction reordering mechanism to a corresponding predefined plurality of ports associated with said one or more execution resources (Lesartre column 5 lines 26-30 and 41-46).

11. Referring to claim 7 Lesartre has taught where the method further comprises the of steps:

(c) providing said instruction reordering mechanism in a form of a queue having a plurality of slots, each said slot having a respective one of said logic elements and means for temporarily storing a respective instruction (Lesartre column 2 lines 18-28 and column 5 lines 26-30); and

(d) propagating said set of said signals successively through said slots of said queue during an execution cycle (Lesartre column 2 lines 36-42 and column 2 line 60-column 3 line 8).

12. Referring to claim 8 Lesartre has taught wherein said set comprises two of more signals (Lesartre column 2 lines 36-42 and column 2 line 60-column 3 line 8).

13. Referring to claim 9 Lesartre has taught where the method further comprises of step:

(c) causing said propagation through only a predefined number of said logic elements during a launch cycle (Lesartre column 12 lines 41-42).

14. Referring to claim 10 Lesartre has taught a method for quickly finding a predefined plurality of instructions, if available, that are ready to be executed and that reside in a queue of a processor that can launch execution of instructions out of order, so that the found instructions can be communicated to a corresponding predefined plurality of ports associated with one or more execution resources, comprising the steps of:

(a) providing said queue having a plurality of slots, each said slot for temporarily storing a respective instruction and launching, when appropriate, execution of said respective instruction (Lesartre column 2 lines 18-28 and column 5 lines 26-30, plurality of instructions interpreted as issuing one instruction after another and so on); and

(b) propagating a set of signals successively through slots of said queue during a launch cycle that, when passed through a particular slot:

(1) selects said particular slot for launching when said particular slot is ready by asserting in said slot one or more found signals that identify one or more specific ports associated with said one or more execution resources (Lesartre column 7 lines 24-31);

(2) refrains from selecting said particular slot when said particular slot is not ready by asserting in said slot a lost signal (Lesartre column 2 lines 35-48; valop signal is propagated forward between the aslots showing if there is a dependency precedes, and if so, indicating to the other aslots that they have not been selected);

(3) keeps track of how many slots have been selected during said launch cycle (Lesartre column 10 lines 50-57, since the signal keeps track if a producer instruction as being present or not, it keeps track of how many slots have been selected); and

(4) causes selection of no more than said predefined plurality of said instructions during said launch cycle (Lesartre column 10 lines 37-49, once the asserted valop signal is propagated to the other slots, it will prevent anymore slots from being selected once a dependency is found).

15. Referring to claim 11 Lesartre has taught where the method further comprises of the step of communicating said predefined plurality of said instructions from said queue to said corresponding predefined plurality of ports associated with said one or more execution resources (Lesartre column 5 lines 26-30 and 41-46).

16. Referring to claim 12 Lesartre has taught where the method further comprises of the step of:

(c) during said launch cycle but after said predefined plurality of said instructions have been selected, propagating a lost signal to remaining slots associated with remaining instructions of said queue to indicate to said remaining slots that their respective remaining instructions have not been selected (Lesartre column 2 lines 35-48; valop signal is propagated forward between the aslots showing if there is a dependency precedes, and if so, indicating to the other aslots that they have not been selected).

17. Referring to claim 13 Lesartre has taught a system for finding a predefined plurality of instructions, if available, that are ready to be executed in a processor that can launch execution of instructions out of order, comprising:

(a) an instruction reordering mechanism for temporarily storing a plurality of said instructions (Lesartre column 2 lines 15-25, plurality of instructions interpreted as issuing one instruction after another and so on); and

(b) a plurality of logic elements associated with said instruction reordering mechanism and associated respectively with each of said instructions in said instruction reordering mechanism for causing and preventing launching, when appropriate, of respective instructions, said logic elements configured to propagate a plurality of signals monotonically through said logic elements that causes said logic elements to select said predefined plurality of said instructions for launching and to de-select any remaining instructions during a launch cycle(Lesartre column 2 lines 23-47; the system taught by Lesartre would propagate the signals during a launch cycle so that the system knew which instructions to launch. If the signals were propagated after the launch cycle, the system would not be able to properly function.).

18. Referring to claim 14 Lesartre has taught wherein each of said logic elements is configured to receive said set of signals from a previous logic element, to evaluate said set of signals to determine whether or not to launch a respective instruction, to modify states associated with said set of signals based upon whether or not said respective instruction was launched, and to propagate said set of said signals to a later logic element (Lesartre column 2 lines 36-56 and lines 60-66 and column 7 lines 24-26).

19. Referring to claim 15 Lesartre has taught wherein each of said logic elements is implemented in combination logic hardware (Lesartre column 3 lines 28-32 and column 2 lines 25-29, where a latch is known to be combinational logic).

20. Referring to claim 16 Lesartre has taught wherein each said logic element is configured to, after said predefined plurality of said instructions have been selected, propagate a lost signal to remaining logic elements associated with said remaining instructions of said instruction reordering mechanism to indicate to said remaining logic elements that their respective

remaining instructions have not been selected (Lesartre column 2 lines 35-48; valop signal is propagated forward between the aslots showing if there is a dependency precedes, and if so, indicating to the other aslots that they have not been selected).

21. Referring to claim 17 Lesartre has taught that the system further comprises of one or more execution resources having one of more ports to receive data from said predefined plurality of said instructions (Lesartre column 5 lines 26-30 and 41-46).

22. Referring to claim 18 Lesartre has taught wherein at least one of said execution resources is an arithmetic logic unit (ALU) (Lesartre figure 3 reference number 42' and column 5 lines 11-15).

23. Referring to claim 19 Lesartre has taught wherein at least one of said execution resources is a multiple accumulate unit (MAC) (Lesartre figure 3 reference number 42'' and column 5 lines 15-22).

24. Referring to claim 20 Lesartre has taught wherein at least one of said execution resources is a cache (Lesartre figure 1 reference number 24 and column 4 lines 55-60).

25. Referring to claim 21 Lesartre has taught wherein said instruction reordering mechanism is a queue (Lesartre column 2 lines 15-22).

26. Referring to claim 22 Lesartre has taught a system further comprising of an arbitration mechanism configured to assert a start signal to one of said logic elements to initiate said propagation of said set of signals (Lesartre column 8 lines 16-25).

27. Referring to claim 23 Lesartre has taught a system for finding a predefined plurality of instructions, if available, that are ready to be executed and that reside in a queue of a processor that can launch execution of instructions out of order, comprising:

(a) queue means for storing a plurality of said instructions, said queue means having a plurality of launch logic means for causing and preventing launching, when appropriate, of a respective instruction (Lesartre column 2 lines 15-32 and lines 42-48, plurality of instructions interpreted as issuing one instruction after another and so on); and

(b) logic means associated with said queue, said logic means for propagating during a launch cycle a set of signals monotonically to successive launch logic means to indicate both when and which of one or more ports of one or more execution resources are available for each said instruction and when none of said ports are available (Lesartre column 10 line 50-column 11 line 8, since the valop signal indicates whether there is a producer instruction, or an instruction being sent to the execution unit, the signal indicates whether a execution unit is available or not).

28. The rejection of the claims are respectfully maintained and incorporated by reference as set forth in the last Office Action, mailed 10/23/02, paper number 3.

Response to Arguments

29. Applicant's arguments filed 01/29/03, paper number 4, have been fully considered but they are not persuasive.

30. In the remarks, in regard to the rejection of claim 1, Applicant argues in essence that:

"...the '474 patent fails to disclose, teach or suggest Applicant's claimed 'propagating a set of signals successively during a launch cycle through said logic elements of said instrucion reordering mechanism that causes said logic elements to track which of the predefined plurality of said instructions are launched and causes the selection of no more than said predefined number of ports during said launch cycle.'"

31. This is not found persuasive. Lesartre (discussed as the '474 patent) does propagate a set of signals through said logic elements of said instruction reordering mechanism (Lesartre column

2 lines 22-66 and figure 4 reference numbers 153, 151, and 188). Several signals are shown being propagated through the slots that receive the instructions. Inherently, the system taught by Lesartre would propagate the signals during a launch cycle so that the system knew which instructions to launch. If the signals were propagated after the launch cycle, the system would not work. Lesartre has taught that when the valdep signal is not asserted the launch control logic is permitted to make a launch, or a launch request that causes a launch to occur (Lesartre column 9 lines 30-34). It would also be necessary for Lesartre to track which of the predefined plurality of said instructions are launched, otherwise, how would the system know which instructions to launch, and which not to launch. Since in Lesartre's preferred embodiment, there are 4 ports to the execution units open per cycle, 2 for integer and 2 for floating-point (Lesartre column 6 lines 57-63), no more than 4 instructions could be allowed to launch per cycle. This is also evident when looking at column 10 lines 50-57, since only four slots can be propagated at a time. Logically, a system cannot select and launch more slots, or instructions, than ports it has available, just as a one gallon bucket cannot hold two gallons of water.

32. In the remarks, in regard to the rejection of claim 10, in addition to the arguments of claim 1, Applicant additionally argues in essence that:

"...the '474 patent fails to disclose, teach or suggest Applicant's claimed ...'keeps track of how many slots have been selected during said launch cycle'"

33. This is not found persuasive. Since only 4 slots, or instructions, can be launched each cycle, the system has to keep track of which slots are available to launch, since trying to launch greater than 4 slots would cause an error in the system. This is done by only propagating four slots at a time (Lesartre column 10 lines 50-57).

34. In the remarks, in regard to the rejection of claim 13, in addition to the arguments of claims 1 and 10, Applicant additionally argues in essence that:

"...the '474 patent fails to disclose, teach or suggest Applicant's claimed ...'plurality of logic elements associated with said instruction reordering mechanism...said logic elements configured to propagate a plurality of signals monotonically through said logic elements that causes said logic elements to select said predefined plurality of said instructions for launching and to de-select any remaining instructions..."

35. This is not found persuasive. Lesartre has taught the logic elements associated with a reordering mechanism (Lesartre figure 2 "Instr reordering mechanism", containing the Aqueue which the aslots are located within). Also Lesartre has taugh propagating signals that cause said logic elements to select instructions and to de-select instructions for launching (Lesartre figure 4 and column 7 lines 13-45; the valdep signal is controlled by the dependencies of the other instructions which are relayed by the signals 153, 151, and 188; the valdep signal, if selected to show no dependences exist and it is available to launch, allows the launch control logic to request the launch which causes a launch to occur from the launch arbitrator).

36. In the remarks, in regard to the rejection of claim 23, Applicant argues in essence that:

"...the '474 patent fails to disclose, teach or suggest Applicant's claimed 'logic means associated with said queue, said logic means for propagating during a launch cycle a set of signals monotonically to successive launch logic means to indicated both when and which of one or more ports of one of more execution resources are available for each said instruction and when none of said ports are available.'"

37. This is not found persuasive. Lesartre has taught the logic means associated with said queue (Lesartre figure 2; the logic means is the Aslot shown in the aqueue of figure 2). Lesartre (discussed as the '474 patent) does propagate a set of signals through said logic elements of said instruction reordering mechanism (Lesartre column 2 lines 22-66 and figure 4 reference numbers 153, 151, and 188). Several signals are shown being propagated through the successive slots that

receive the instructions. Inherently, the system taught by Lesartre would propagate the signals during a launch cycle so that the system knew which instructions to launch. If the signals were propagated after the launch cycle, the system would not be able to properly function. Logically, the system would have to keep track of which ports are available; otherwise the system may try to launch two slots using the same port, which what cause an error. This would relate to trying to dump two different gallons of water into the same gallon bucket. Only one slot can be launched in each port, so it is required of the system to track which port is or is not available for each clock cycle.

Also, since the signal signal valcb is sent to indicate if a dependency exists for the instruction (Lesartre column 8 lines 16-25 and column 10 lines 6-12 column 7 lines 13-45), the fact that that instruction is dependent upon another instruction, then the resources (i.e. register or memory) for that instruction are not available for that clock cycle.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles A Harkness whose telephone number is 703-305-7579. The examiner can normally be reached on 8:00 A.M. – 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on 703-305-9712. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-7239 for regular communications and 703-746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-7579.

Charles Allen Harkness
Examiner
Art Unit 2183
March 28, 2003

EDDIE CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100